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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/527,052

03/09/2005

Shin Horiuchi

040894-7196

6844

9629 7590 05/26/2009  
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EXAMINER

BURKHART, ELIZABETH A

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

05/26/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/527,052	<b>Applicant(s)</b> HORIUCHI, SHIN	
	<b>Examiner</b> Elizabeth Burkhart	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 May 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 7-9 is/are pending in the application.
- 4a) Of the above claim(s) 8 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 7 and 9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

1. Claims 1-3 and 7-9 are pending in the application. Amended claims 1, 2, and 9 have been noted. Claim 8 has been withdrawn from consideration as being drawn to a nonelected invention.

#### ***Continued Examination Under 37 CFR 1.114***

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/11/2009 has been entered.

#### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakao in view of Won et al (US 2002/0145132) and further in view of Beauvois et al or Hanus et al.

Nakao teaches a process for producing a PMMA-Pd metal cluster composite which comprises bringing PMMA (sheet) into contact with vapor of a heavy metal compound while heating. The heavy metal compound may be an acetylacetonate

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complex of palladium, platinum, or copper. The PMMA sheet is brought into contact with the heavy metal compound vapor in a non-oxidizing atmosphere (nitrogen) and at a temperature (180°C) above the glass transition temperature of the PMMA sheet (105°C) (p. 766-767).

Nakao does not teach irradiating the PMMA with ultraviolet radiation to increase reducing power toward the heavy metal and subsequently bringing the irradiated PMMA in contact with the heavy metal vapor, wherein said UV irradiation has a wavelength from 250 to 350 nm and a dose of 0.1 to 2 J/cm<sup>2</sup>.

Won teaches forming a polymer-metal cluster composite wherein the polymer is irradiated with ultraviolet radiation to excite the electrons and generate a radical which gives electron to the metal ion, thereby the metal ion is reduced to metal. The metal may be palladium, platinum, copper, etc. and the polymer may be polymethyl methacrylate (PMMA). The wavelength of the UV radiation may be 200-750 nm ([0024]-[0030], [0106], Table 1).

Beauvois teaches irradiating PMMA-copper acetylacetonate composite films with ultraviolet radiation to decompose the copper acetylacetonate to form copper within the film. Beauvois also teaches that decomposition of the copper acetylacetonate may be performed by heating or by direct energy beam (i.e. UV), wherein said energy beam has a dose within the claimed range (Abstract, p. 167, 170-171). Hanus teaches that a PMMA-metal cluster composite may be formed by decomposing CuAcAc by UV irradiation, wherein said irradiation has a dose within the claimed range (Abstract, p. 320).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to expose the PMMA in the process of Nakao to ultraviolet irradiation as suggested by Won in order to improve the reduction of the metal precursor to metal since Nakao discloses that Pd cluster formation is very slow using heat treatment and the UV treatment of Won would cause a transition which increases reducing power toward the metal precursor [0027]-[0029], thus forming metal clusters faster (Table 2). It would have been obvious to irradiate the PMMA of Nakao using a dose of UV irradiation suggested by Beauvois or Hanus since this was a suitable dose for reducing the precursors of Nakao to metal clusters in the presence of PMMA.

Regarding Claims 1 and 2, Won does not teach irradiating the PMMA prior to contact with the metal precursor, however one of ordinary skill in the art would have reasonably expected the UV radiation to excite the electrons of the PMMA and form a radical to thereby reduce the metal precursor whether the radiation is applied just before or during contact with the metal precursor since the radiation would increase the reducing power toward the metal by generating a radical regardless of whether the metal precursor is present.

Regarding Claim 2, Hanus teaches that the metal nanoclusters may be formed in a predetermined pattern (p. 320).

Thus, claims 1-3 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Nakao, Won, and Beauvois or Hanus.

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4. Claims 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakao in view of Won et al (US 2002/0145132) and Beauvois et al or Hanus et al as applied above and further in view of Zhang et al.

Nakao, Won, Beauvois, and Hanus do not teach forming a predetermined pattern by masking.

Zhang teaches selectively decomposing platinum acetylacetonate using UV irradiation (excimer lamp) wherein a mask is employed to form a desired pattern of platinum on the substrate (p. 996).

It would have been obvious to one of ordinary skill in the art at the time of invention by applicant to use a mask as suggested by Zhang in the process of Nakao in order to selectively reduce the metal acetylacetonate complex to form metal clusters in a desired pattern. It would have been obvious to one of ordinary skill to apply the mask at any time prior to decomposition of the metal precursor of Nakao in order to form the desired pattern of metal clusters since irradiating the PMMA prior to masking or after masking would achieve the same, predictable result of forming metal clusters in desired areas not covered by the mask.

Thus, claims 7 and 9 would have been obvious within the meaning of 35 USC 103 over the combined teachings of Nakao, Won, Beauvois or Hanus, and Zhang.

### ***Response to Arguments***

5. Applicant's arguments are directed toward the new limitation in the claims which has been addressed in the rejections above. Applicant's arguments with respect to the

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Zhou reference have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues that both Beauvois and Hanus require formation of the CuAcAc-PMMA cluster before irradiation while the claimed invention is directed to a substrate unassociated with the heavy metal compound prior to irradiation. Won similarly teaches that the metal compound is present in the polymer prior to irradiation. However Won also teaches that UV radiation excited electrons in the polymer to generate a radical which gives an electron to the metal ion thereby reducing the metal ion to metal [0029]. Thus, one of ordinary skill in the art would have reasonably expected the UV radiation to excite the electrons of the PMMA and form a radical to thereby reduce the metal precursor whether the radiation is applied just before or during contact with the metal precursor since the radiation would increase the reducing power toward the metal by generating a radical regardless of whether the metal precursor is present.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Burkhart whose telephone number is (571)272-6647. The examiner can normally be reached on M-Th 7-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for

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published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Elizabeth Burkhart/  
Examiner, Art Unit 1792

/Timothy H Meeks/  
Supervisory Patent Examiner, Art Unit 1792